

# PATENT ABSTRACTS OF JAPAN

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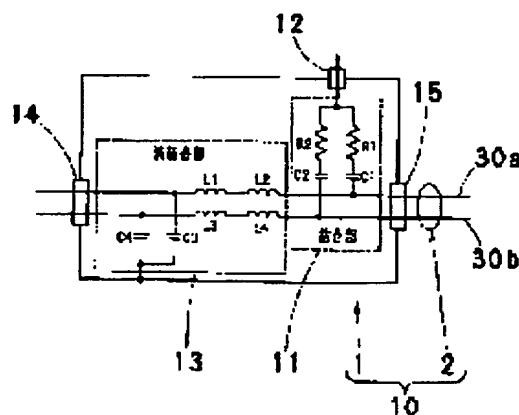
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## (54) NOISE TESTING DEVICE AND METHOD

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To sufficiently prevent a test signal with a prescribed frequency from leaking to another system.

**SOLUTION:** This device is provided with a coupling part 11 for inputting a test signal having a prescribed frequency into an input and output line of an electronic equipment, and a decoupling part 13 having plural ring-type coils L1, L2, L3, L4 connected in series each other and having capacitors C3, C4 connected to the coils L1, L2, L3, L4, and for preventing the test signal from leaking to another system. Since the coils L1, L2, L3, L4 connected each other are increased in the winding number as total compared with one ring-type coil, inductance is increased, and the test signal input to the input and output line of the electronic equipment is prevented from leaking to another system.



## LEGAL STATUS

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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]** The noise testing device characterized by having the decoupling section which has the capacitor connected to the bond part for inputting a stimulus with a predetermined frequency into the input output line of electronic equipment, the coil of two or more ring types by which the series connection was carried out, and its coil, and prevents leakage of said stimulus to other networks.

**[Claim 2]** Said two or more coils are noise testing devices according to claim 1 characterized by being arranged so that each magnetic flux may intersect perpendicularly.

**[Claim 3]** A noise testing device given in either claim 1 characterized by preparing the amperometry section which measures the common mode current based on said inputted stimulus, or claim 2.

**[Claim 4]** The bond part for inputting a stimulus with a predetermined frequency into the input output line of electronic equipment, With the noise testing device equipped with the decoupling section which has the capacitor connected to the coil of two or more ring types by which the series connection was carried out, and its coil, and prevents leakage of said stimulus to other networks The test method of the noise testing device characterized by being the test method of the noise testing device which performs the trial about the noise of said electronic equipment, measuring the common mode current based on said inputted stimulus, and inputting said stimulus according to the measured common mode current.

**[Claim 5]** The bond part for inputting a stimulus with a predetermined frequency into the input output line of electronic equipment, With the noise testing device equipped with the decoupling section which has the capacitor connected to the coil of two or more ring types by which the series connection was carried out, and its coil, and prevents leakage of said stimulus to other networks The test method of the noise testing device characterized by inputting said stimulus based on the common mode impedance which is the test method of the noise testing device which performs the trial about the noise of said electronic equipment, and said electronic equipment has.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the noise testing device by which the AM broadcast noise resistance of electronic equipment is evaluated.

[0002]

[Description of the Prior Art] Conventionally, what is shown in drawing 8 as this kind of a noise testing device exists. This thing is a bond part X. And the decoupling section Y It has. Bond part X It is for inputting a stimulus with AM broadcast-band frequency into the input output line of electronic equipment. Decoupling section Y It has 2 sets of circuitry for decoupling which consists of a capacitor Y2 connected to the coil Y1 of one ring type, and its coil Y1, and leakage of the stimulus to other networks is prevented.

[0003] This thing is Coil Y by making the winding consistency of a coil Y1 increase, or enlarging coil Y1 of a ring type itself and increasing the number of winding. Since an inductance can be increased, the leakage to the other networks of the stimulus inputted into the input output line of electronic equipment can be prevented.

[0004]

[Problem(s) to be Solved by the Invention] It is Coil Y if it is in the above-mentioned Prior art. If a winding consistency is made to increase, or coil Y1 of a ring type itself is enlarged and the number of winding is increased Since the peak value of an inductance shifts from the condition shown in drawing 9 as the continuous line to the condition which shows in this drawing with a broken line at a low frequency side The inductance could be increased in the desired frequency domain and there was a trouble that the leakage to the other networks of a stimulus with \*\*, as a result AM broadcast-band frequency which is a predetermined frequency could not fully be prevented.

[0005] This invention was made paying attention to the above-mentioned point, and the place made into the purpose is to offer the noise testing device which can fully prevent the leakage to the other networks of a stimulus with the predetermined wave number, and its \*\*\*\*\*.

[0006]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention according to claim 1 is carried out to the configuration equipped with the decoupling section which has the capacitor connected to the bond part for inputting a stimulus with a predetermined frequency into the input output line of electronic equipment, the coil of two or more ring types by which the series connection was carried out, and its coil, and prevents leakage of said stimulus to other networks.

[0007] In invention according to claim 1, said two or more coils are carrying out invention according to claim 2 to the configuration arranged so that each magnetic flux might intersect perpendicularly.

[0008] Invention according to claim 3 is carried out to the configuration in which the amperometry section which measures the common mode current based on said stimulus inputted into either claim 1 or claim 2 in invention of a publication was prepared.

[0009] A bond part for invention according to claim 4 to input a stimulus with a predetermined frequency into the input output line of electronic equipment, With the noise testing device equipped with the decoupling section which has the capacitor connected to the coil of two or more ring types by which the series connection was carried out, and its coil, and prevents leakage of said stimulus to

other networks It is the test method of the noise testing device which performs the trial about the noise of said electronic equipment, and he measures the common mode current based on said inputted stimulus, and is trying to input said stimulus according to the measured common mode current.

[0010] A bond part for invention according to claim 5 to input a stimulus with a predetermined frequency into the input output line of electronic equipment, With the noise testing device equipped with the decoupling section which has the capacitor connected to the coil of two or more ring types by which the series connection was carried out, and its coil, and prevents leakage of said stimulus to other networks He is the test method of the noise testing device which performs the trial about the noise of said electronic equipment, and is trying to input said stimulus based on the common mode impedance which said electronic equipment has.

[0011]

[Embodiment of the Invention] One operation gestalt of this invention is explained below based on drawing 1 thru/or drawing 7 . This noise testing device 10 is the body 1 of equipment. And current probe 2 (amperometry section) It is had and constituted.

[0012] Body 1 of equipment It consisted of a metal box and two circuit blocks are held in the inner direction. One side of these two circuit blocks makes the bond part 11 for inputting a stimulus with AM broadcast-band frequency into the input output line 30 of electronic equipment 20, and consists of the 1st resistance R1, the 2nd resistance R2, the 1st capacitor C1, and the 2nd capacitor C2.

[0013] The 1st resistance R1 minds the 1st capacitor C1 connected to the end, and is one input output line 30a of electronic equipment 20. It connects. The 2nd resistance R2 minds the 2nd capacitor C2 connected to the end, and is input output line 30b of another side of electronic equipment 20. While connecting, the other end is connected to the other end of the 1st resistance R1. The signal input part 12 by which a stimulus with AM broadcast-band frequency which is a predetermined frequency is inputted is connected to the connection part of these 1st resistance R1 and 2nd resistance R2.

[0014] On the other hand, body 1 of equipment The decoupling [ which was held ] section 13 whose another side of two circuit blocks prevents leakage of the above-mentioned stimulus to other networks, such as a source power supply, is made, and it consists of the 1st coil L1, the 2nd coil L2, the 3rd coil L3, the 4th coil L4, the 3rd capacitor C3, and the 4th capacitor C4. in addition, the 1st coil L1 thru/or 4th coil L4 is shown in drawing 3 -- as -- any -- ferrite core C Level criteria metal plate 40a which is the coil of the ring type which it has and is used by noise-proof trial capacity coupling of a between is made small -- as -- body 1 of equipment from -- it has a predetermined distance and is arranged. In addition, about a noise-proof trial, it mentions later in detail.

[0015] The 1st coil L1 is one input output line 30a of electronic equipment 20 in the 2nd coil L2 by which series connection was carried out. It connects. The 3rd coil L3 is input output line 30b of another side of electronic equipment 20 in the 4th coil L4 by which series connection was carried out. It connects. These the 1st coil L1 and 3rd coil L3 are both the input output lines 30a and 30b of other networks, such as a source power supply, to the electronic equipment 20. The other network connection 14 for inputting power is connected. On the other hand, the 2nd coil L2 and 4th coil L4 are both the input output lines 30a and 30b of electronic equipment 20 in the above-mentioned stimulus about the power inputted into the other network connection 14. The outputting signal output part 15 is connected.

[0016] Moreover, as the 1st coil L1 and 3rd coil L3 are shown in drawing 2 , it is the 1st coil block LL 1. It is in the winding condition to make. As the 2nd coil L2 and 4th coil L4 are shown in drawing 2 on the other hand, it is the 2nd coil block LL 2. It is in the winding condition to make and is the 1st coil block LL 1. Shaft orientations lie at right angles mutually. Thus, 1st coil block LL 1 And 2nd coil block LL 2 When shaft orientations intersect perpendicularly, while the magnetic flux of the 1st coil L1 and the 2nd coil L2 intersects perpendicularly mutually, the magnetic flux of the 3rd coil L3 and the 4th coil L4 comes to intersect perpendicularly mutually.

[0017] For the 3rd capacitor C3, the other end is the body 1 of equipment while the end is connected between the 1st coil L1 and the other network connection 14. It connects. For the 4th capacitor C4, the other end is the body 1 of equipment while the end is connected between the 3rd coil L3 and the other network connection 14. It connects.

[0018] Next, based on drawing 4, this noise testing device 10 explains the configuration for carrying out the noise-proof sex test of electronic equipment 20. The electronic equipment 20 by which a noise-proof trial is made is level criteria metal plate 40a grounded with this noise testing device 10. Insulating-stand 40b arranged upwards It lays. As for this electronic equipment 20, the power from other networks is inputted from the signal output part 15 of this noise testing device 10. here -- the signal input part 12 of this noise testing device 10 -- stimulus generating section 50a from -- the above-mentioned stimulus which has generated AM broadcast-band frequency -- power amplification 50b And attenuator 50c If inputted, when it minds, and it will be alike and the power from other networks will be inputted more, the above-mentioned stimulus will also be inputted into coincidence.

[0019] At this time, it is the current probe (amperometry section) 2. He is trying to measure the common mode current based on the above-mentioned stimulus. detailed -- a common mode current - - being based -- current probe 2 from -- the outputted signal level -- spectrum analyzer 50d He is trying to measure.

[0020] In addition, current probe 2 The measurement by which the common mode current was stabilized is possible by being arranged in a position so that it may not be influenced of a standing wave. In this way, it responds to the measured measurement result and is power amplification 50b. The input level of a stimulus is adjusted.

[0021] Moreover, the electronic equipment 20 by which a noise-proof trial is made by this noise testing device 10 is power amplification 50b, after calculating the common mode current which was adapted for the impedance in detail according to the impedance after measuring the impedance which each has since each has the impedance of a proper by the predetermined formula. The input level of a stimulus is adjusted separately.

[0022] Next, based on drawing 6, the measurement procedure of the impedance of electronic equipment 20 is explained. The electronic equipment 20 by which an impedance is measured is electronic equipment 20 and level criteria metal plate 40a in detail like the case of the noise-proof trial mentioned above. Level criteria metal plate 40a grounded by making distance the same Insulating-stand 40b arranged upwards It lays. Furthermore, grounded perpendicular criteria metal plate 40c Cable 40d which has the same leading-about die length as the case of the noise-proof trial mentioned above It has, and electronic equipment 20 is connected, for example, it is network analyzer 50e. An impedance is measured.

[0023] Since the number of winding increases as a whole as compared with the coil of one ring type, an inductance can be increased, and the 1st coil C1 and 2nd coil L2 of a ring type which were connected if it was in this noise testing device 10 are both the input output lines 30a and 30b of electronic equipment 20. The leakage to the other networks of the inputted stimulus can be prevented. Similarly, since the number of winding of the coil [ 3rd / coil L3 and 4th coil L4 ] of a ring type which were connected increases as compared with the coil of one ring type, an inductance can be increased, and they are both the input output lines 30a and 30b of electronic equipment 20. The leakage to the other networks of the inputted stimulus can be prevented.

[0024] Since the winding consistency of the coil of a ring type is made to increase, or the path of the coil of a ring type itself is not enlarged and the number of winding is not necessarily made to increase unlike the conventional example, to and the condition which shows in this drawing with a broken line from the condition shown in drawing 7 as the continuous line Since the peak value of an inductance cannot shift to a low frequency side, and an inductance can be increased to this drawing in a desired frequency domain as an alternate long and short dash line shows, if it pulls The inductance in AM broadcast-band frequency can be increased, and the leakage to the other networks of a stimulus can fully be prevented.

[0025] Moreover, the common mode current based on a stimulus While flowing in the 1st coil L1 and 2nd coil L2 of a ring type which were arranged so that each magnetic flux might intersect perpendicularly By flowing in the 3rd coil L3 and 4th coil L4 of a ring type which were arranged so that each magnetic flux might intersect perpendicularly It comes to decrease and they are both the input output lines 30a and 30b of electronic equipment 20. The effectiveness that the leakage to the other networks of the inputted stimulus can be prevented can be done so much more.

[0026] Moreover, current probe 2 Since it can have, the common mode current based on the inputted

stimulus can be measured and the input of a stimulus can be adjusted according to the measurement result of the common mode current, a stimulus can be inputted on suitable level, as a result precision of the trial about the noise of electronic equipment 20 can be made high.

[0027] Moreover, since the input level of a stimulus can be adjusted based on the common mode impedance which electronic equipment 20 itself has, a stimulus can be inputted on suitable level, as a result precision of the trial about the noise of electronic equipment 20 can be made high.

[0028] In addition, at this operation gestalt, it is the 1st coil block LL 1. And 2nd coil block LL 2 It forms and they are those the coil blocks LL1 and LL2 of both. By intersecting perpendicularly Although he is trying for the magnetic flux of the 3rd coil L3 and the 4th coil L4 to intersect perpendicularly mutually while the magnetic flux of the 1st coil L1 and the 2nd coil L2 intersects perpendicularly mutually 1st coil block LL 1 And 2nd coil block LL 2 Without forming The same effectiveness can be done so even if it makes it the magnetic flux of the 3rd coil L3 and the 4th coil L4 intersect perpendicularly mutually, while the magnetic flux of the 1st coil L1 and the 2nd coil L2 intersects perpendicularly mutually.

[0029] Moreover, with this operation gestalt, although a predetermined frequency is AM broadcast-band frequency, even if it is a frequency of the medium wave of 300k per-second - 30M per second, or short wave, it can do the same effectiveness so, for example.

[0030]

[Effect of the Invention] Since the number of winding of the coil of two or more ring types to which invention according to claim 1 was connected mutually increases as a whole as compared with the coil of one ring type, it can increase an inductance and can prevent the leakage to the other networks of the stimulus inputted into the input output line of electronic equipment. And since the winding consistency of the coil of a ring type is made to increase, or the path of the coil of a ring type itself is not enlarged and the number of winding is not necessarily made to increase unlike the conventional example Since the peak value of an inductance cannot shift to a low frequency side and an inductance can be increased in a desired frequency domain as a result, the inductance in a predetermined frequency can be increased and the leakage to the other networks of a stimulus can fully be prevented.

[0031] When invention according to claim 2 flows in the coil of two or more ring types with which in addition to the effect of the invention according to claim 1 the common mode current based on a stimulus was arranged so that each magnetic flux might intersect perpendicularly, it comes to decrease and the effectiveness that the leakage to the other networks of the stimulus inputted into the input output line of electronic equipment can be prevented can be done so much more.

[0032] Since invention according to claim 3 can measure the common mode current based on the stimulus inputted as the amperometry section being in addition to an effect of the invention according to claim 1 and can adjust the input of a stimulus according to the measurement result of the common mode current, it can input a stimulus on suitable level, as a result can make high precision of the trial about the noise of electronic equipment.

[0033] Since the number of winding of the coil of two or more ring types to which invention according to claim 4 was connected mutually increases as a whole as compared with the coil of one ring type, it can increase an inductance and can prevent the leakage to the other networks of the stimulus inputted into the input output line of electronic equipment. And since the winding consistency of the coil of a ring type is made to increase, or the path of the coil of a ring type itself is not enlarged and the number of winding is not necessarily made to increase unlike the conventional example Since the peak value of an inductance cannot shift to a low frequency side and an inductance can be increased in a desired frequency domain as a result, the inductance in a predetermined frequency can be increased and the leakage to the other networks of a stimulus can fully be prevented.

[0034] Furthermore, since the common mode current based on the inputted stimulus can be measured and the input level of a stimulus can be adjusted according to the measurement result of the common mode current, a stimulus can be inputted on suitable level, as a result precision of the trial about the noise of electronic equipment can be made high.

[0035] Since the number of winding of the coil of two or more ring types to which invention according to claim 5 was connected mutually increases as a whole as compared with the coil of one

ring type, it can increase an inductance and can prevent the leakage to the other networks of the stimulus inputted into the input output line of electronic equipment. And since the winding consistency of the coil of a ring type is made to increase, or the path of the coil of a ring type itself is not enlarged and the number of winding is not necessarily made to increase unlike the conventional example Since the peak value of an inductance cannot shift to a low frequency side and an inductance can be increased in a desired frequency domain as a result, the inductance in a predetermined frequency can be increased and the leakage to the other networks of a stimulus can fully be prevented.

[0036] Furthermore, since the input level of a stimulus can be adjusted based on the common mode impedance which the electronic equipment itself has, a stimulus can be inputted on suitable level, as a result precision of the trial about the noise of electronic equipment can be made high.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the circuit diagram of 1 operation gestalt of this invention.

[Drawing 2] It is the perspective view of two coils same as the above.

[Drawing 3] It is the explanatory view of the winding condition of a coil same as the above.

[Drawing 4] It is the block diagram showing the operation condition of the trial about the noise by the same as the above.

[Drawing 5] It is the perspective view showing the operation condition of the trial about the noise by the same as the above.

[Drawing 6] It is the block diagram showing the measurement condition of the impedance of electronic equipment that the trial about a noise is made by the same as the above.

[Drawing 7] It is the explanatory view showing the relation between the inductance of a coil same as the above, and a frequency.

[Drawing 8] It is the circuit diagram of the conventional example.

[Drawing 9] It is the explanatory view showing the relation between the inductance of a coil same as the above, and a frequency.

[Description of Notations]

11 Bond Part

13 Decoupling Section

2 Current Probe (Amperometry Section)

L1 The 1st coil

L2 The 2nd coil

L3 The 3rd coil

L4 The 4th coil

C3 The 3rd capacitor

C4 The 4th capacitor

10 Noise Testing Device

20 Electronic Equipment

30a One input output line

30b The input output line of another side

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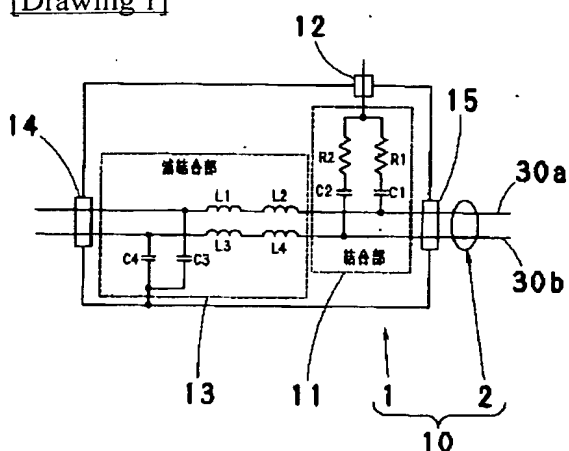
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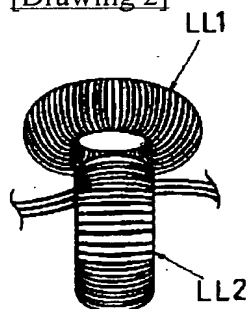
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## DRAWINGS

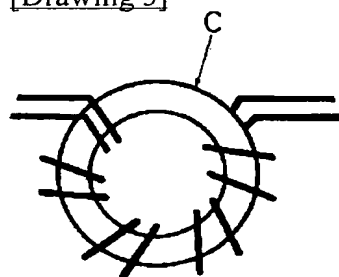
[Drawing 1]



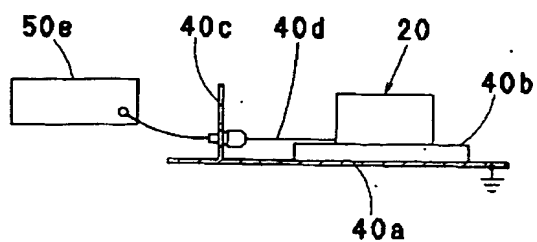
[Drawing 2]



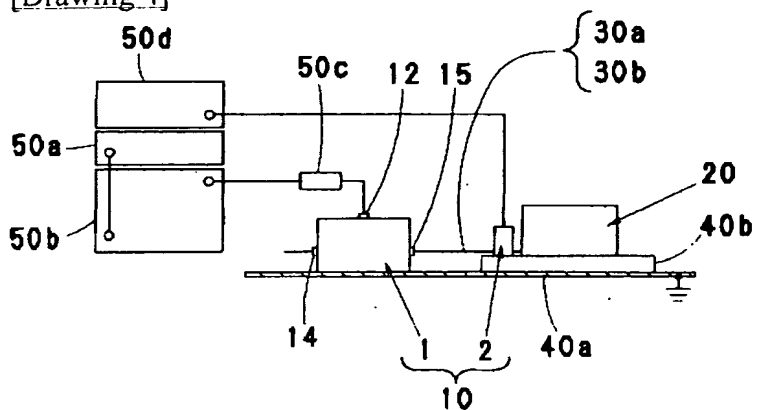
[Drawing 3]



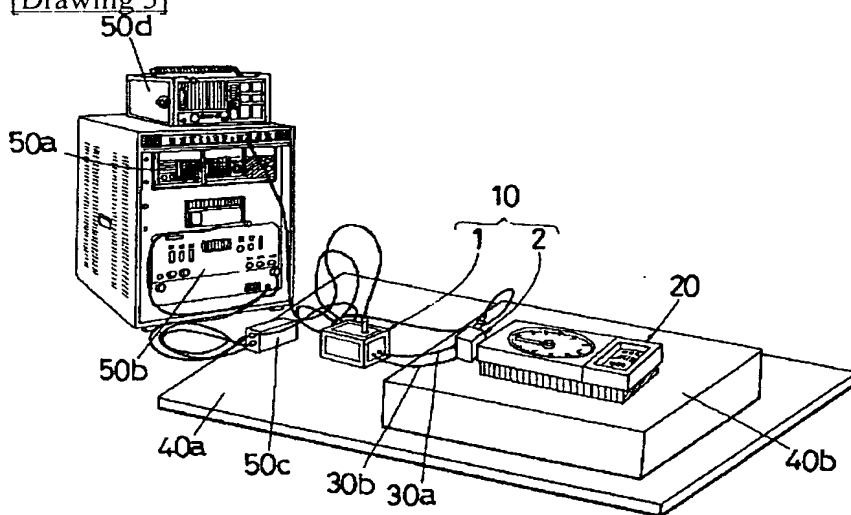
[Drawing 6]



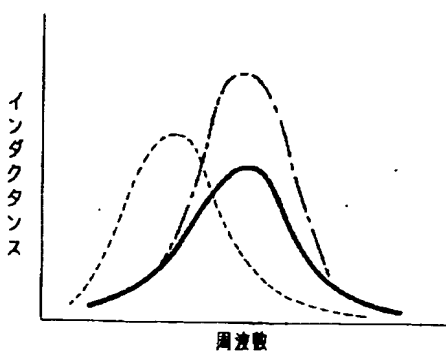
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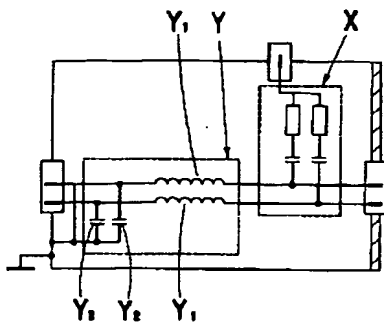
[Drawing 5]



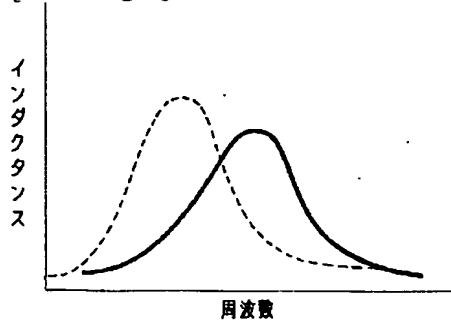
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]